Fig. 1.

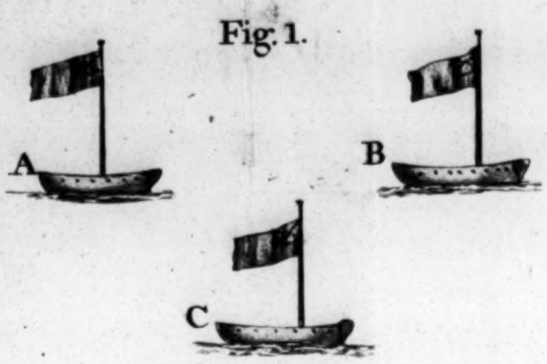


Fig. 2.

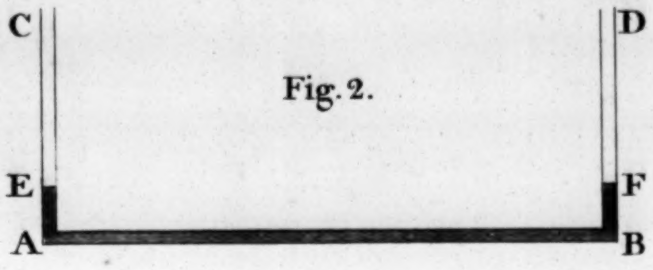


Fig. 3.

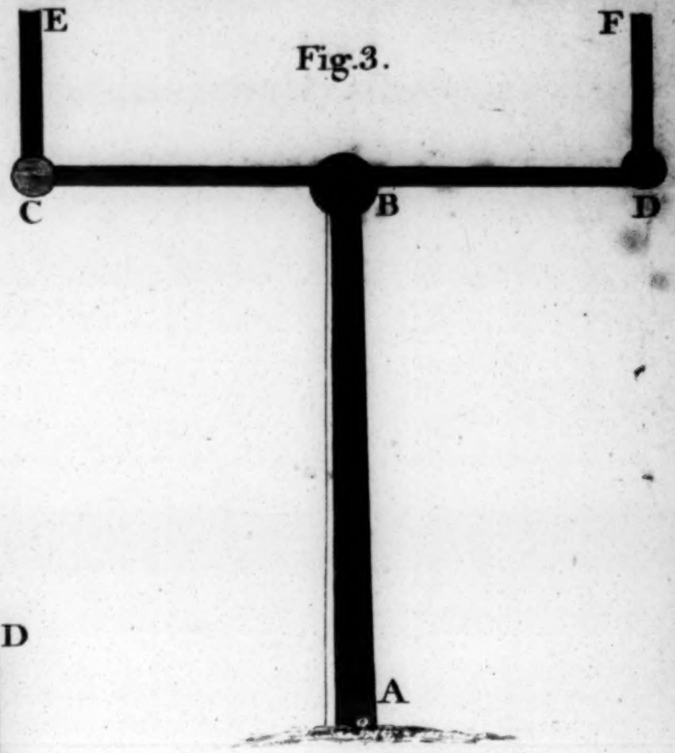


Fig. 4.

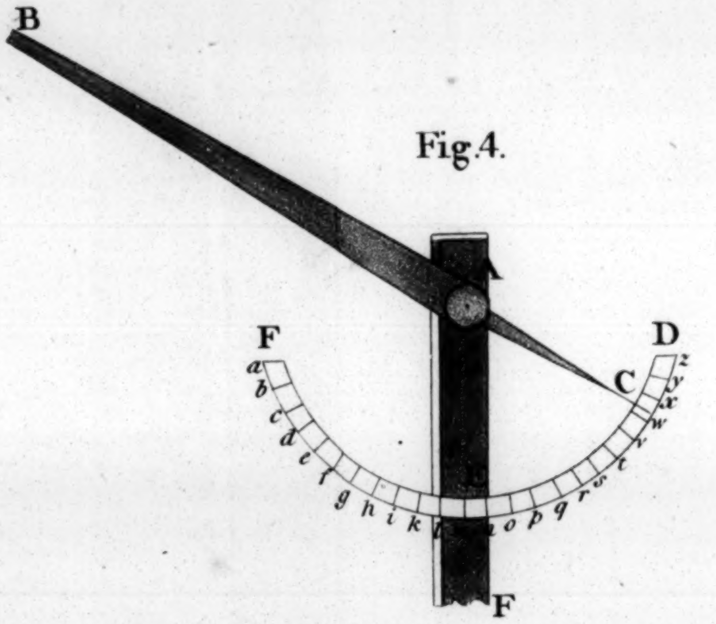


Fig. 5.

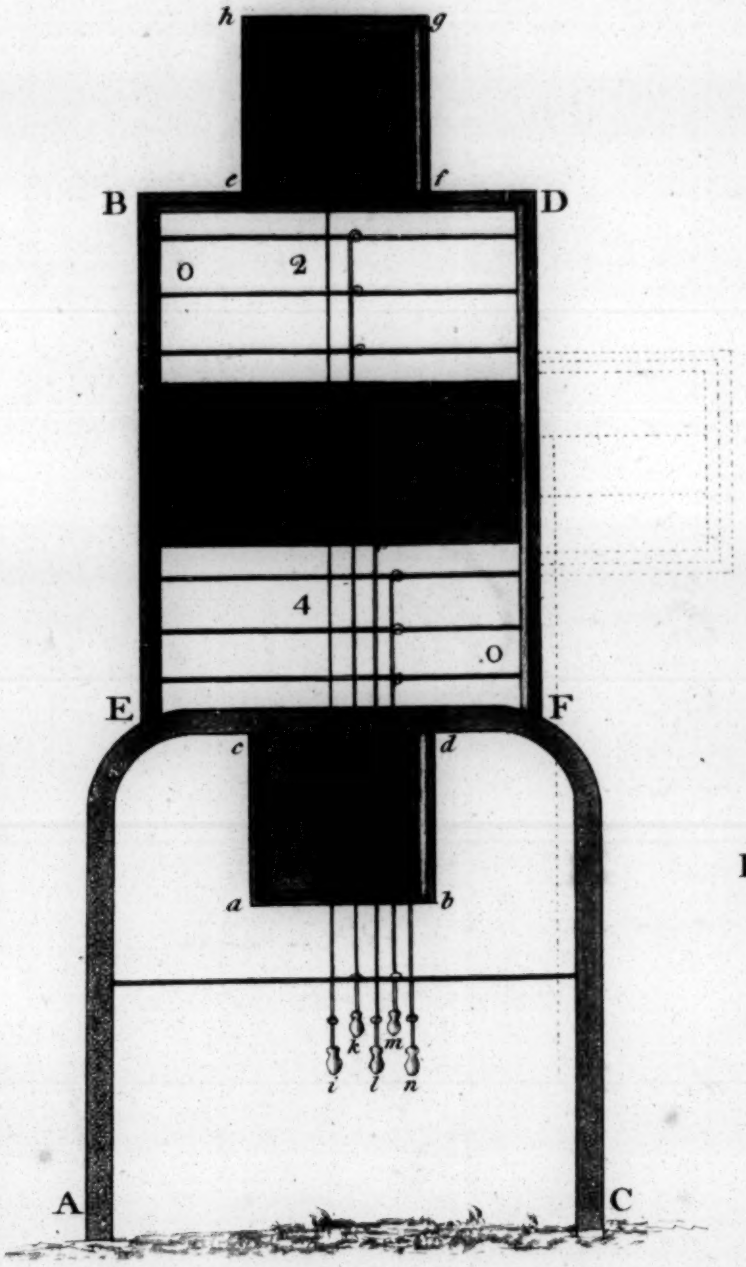


Fig. 6.

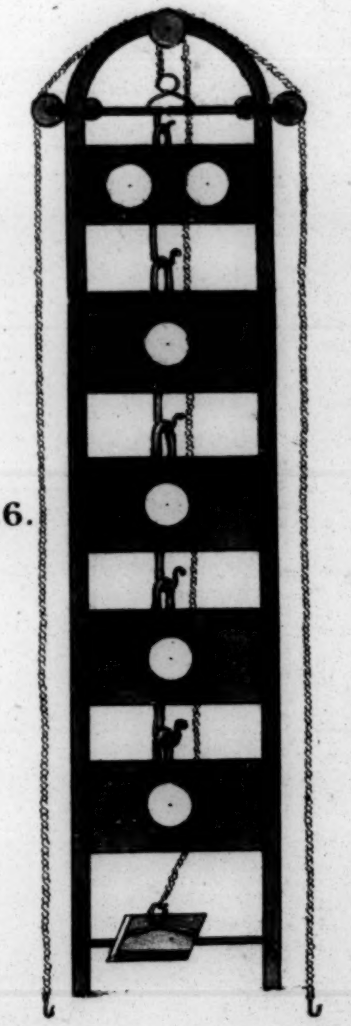


Fig. 7.

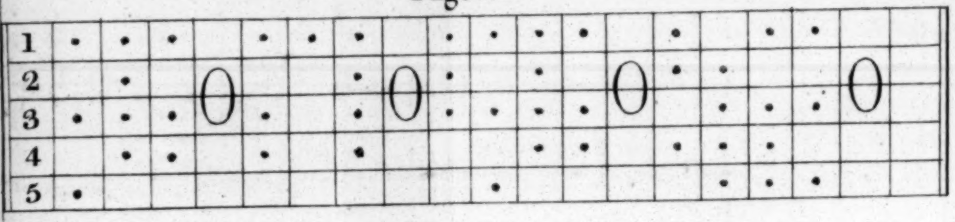
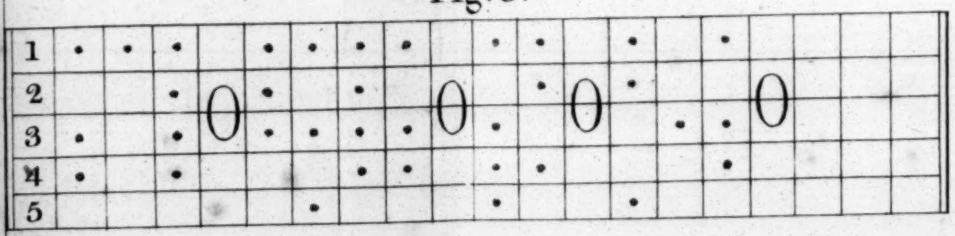
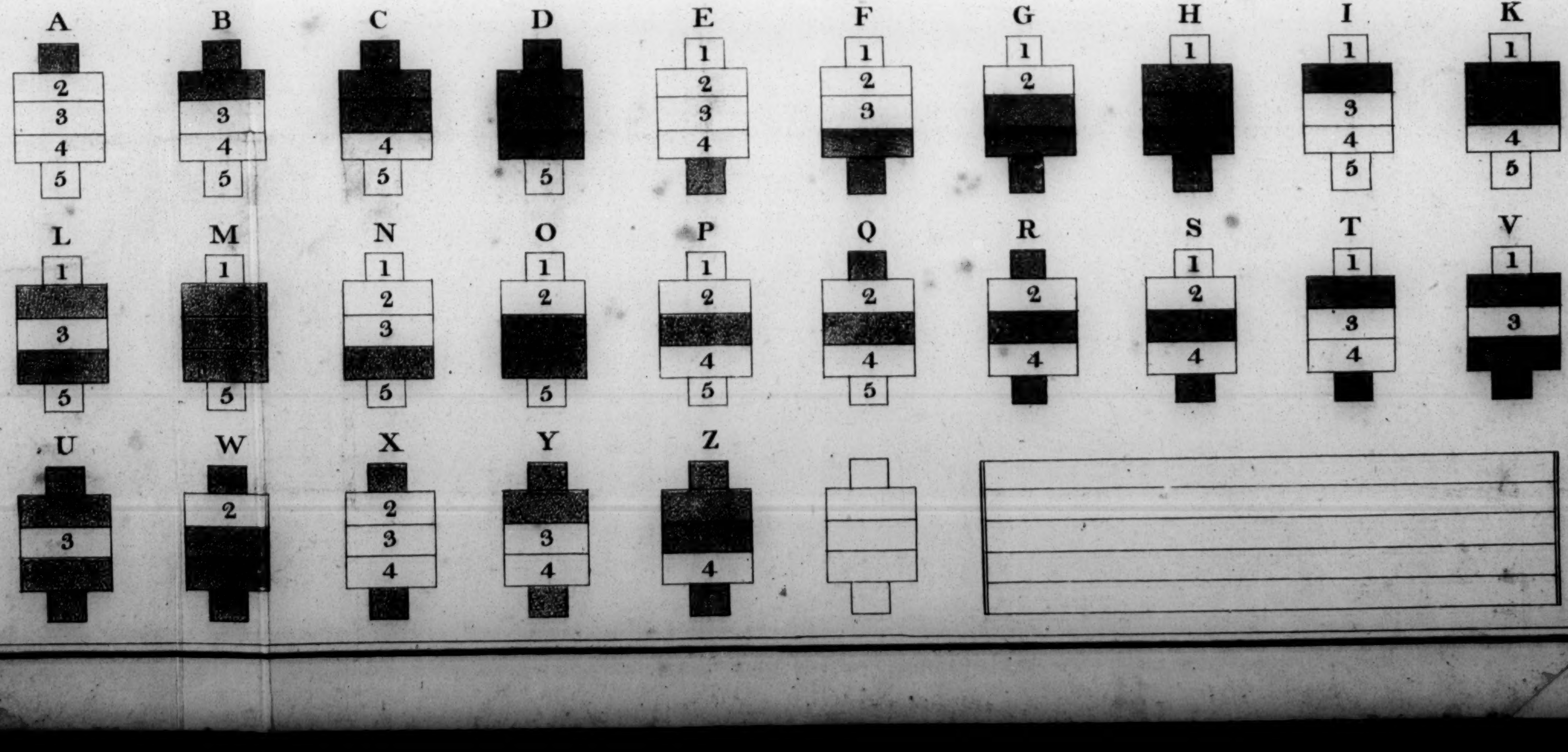


Fig. 8.





k Gamble (J.)

OBSERVATIONS

ON

TELEGRAPHIC EXPERIMENTS.

OR

THE DIFFERENT MODES

WHICH HAVE BEEN, OR MAY BE ADOPTED FOR THE PURPOSE OF

DISTANT COMMUNICATION.

G.R. III
BRITISH MUSEUM

TO HIS

ROYAL HIGHNESS

FREDERICK,

DUKE OF YORK AND ALBANY,

PRINCE BISHOP OF OSNABURGH,

EARL OF ULSTER IN IRELAND,

FIELD MARSHAL OF HIS MAJESTY'S FORCES,

KNIGHT OF THE MOST NOBLE ORDER OF THE GARTER; K. B.
&c. &c. &c.

THE FOLLOWING PAPER

IS GRATEFULLY INSCRIBED

BY

J. GAMBLE,

CHAPLAIN ON THE STAFF

TO HIS ROYAL HIGHNESS.

OBSERVATIONS

ON

TELEGRAPHIC EXPERIMENTS.

THE object propoſed is, to obtain an intelligible figurative language, which may be diſtinguiſhed at a diſtance, and by which the obvious delay in the diſpatch of orders or information by meſſenger may be avoided.

By the term intelligible I mean, that its language ſhould be ſuch as is leaſt ſubject to error or miſtake in the giving or receiving.

That the language ſhould alſo be figurative, will appear from the conſideration that otherwiſe every perſon concerned, even in the manual operation, would have it in his power either to diſcover or counteract the intended information.---The latter part of the definition is clear; that it ſhould be diſtinguiſhed at a diſtance both by day and night, and even as far as poſſible in foggy weather.

On firſt reflection we find the practicable modes of ſuch diſtant communication muſt be confined to ſound and viſion. Each of which is in a great degree ſubject to the ſtate of the atmoſphere: as, independent of the wind's direction, it is known that the air is oftimes ſo far deprived of its elaſticity, or whatever other quality the conveyance of ſound depends upon, that the heavieſt ordnance is ſcarce heard farther than the ſhot flies; it is alſo well known, that in thick hazy weather the largeſt objects become totally obſcured at a ſhort diſtance. Theſe are inconveniences attending every poſſible mode of conveying information to a diſtance by ſound or viſion. No inſtrument, therefore, deſtined for the purpoſe can be perfect. We can only endeavour to diminiſh theſe irremediable defects in the greateſt poſſible degree.

It appears that the Romans had a method in their walled cities, either by a hollow formed in the maſonry, or by tubes affixed to it, ſo to confine and augment ſound as to convey information to any part they wiſhed; and in lofty houſes it is now ſometimes the cuſtom to have a pipe, by way of ſpeaking trumpet, to give orders from the upper to the lower apartments: by this mode of confining ſound its volume may be carried to a diſtance very great; but beyond a certain extent the ſound loſes articulation, and would only convey alarm, not give directions.

Every city of antient date had its watch-towers, and alſo the caſtra ſtativa of the Romans, had conſtantly ſome ſpot, elevated either by nature or art, from whence ſignals were given to the troops cantoned or foraging in the neighbourhood. But I believe they had not arrived to greater refinement than that on ſeeing a certain ſignal they were immediately to repair to their appointed ſtations.

A beacon or bonfire made of the firſt inflammable materials that offered, as the moſt obvious, is, perhaps, the moſt antient mode of general alarm; and by being previouſly concerted, the number or point where the fires appeared might have its particular intelligence affixed. The ſame obſervations may be referred to the throwing up of rockets, whoſe number or point from whence thrown may have its affixed ſignification.

Flags or enſigns with their various devices are of earlieſt invention, eſpecially at ſea; where, from the firſt idea, which moſt probably was that of a vane to ſhew the direction of the wind, they have been long adopted as the diſtinguiſhing mark of nations, and are now ſo neatly combined by the ingenuity of a great naval commander, that by his ſyſtem every requiſite order and queſtion is received and anſwered by the moſt diſtant ſhips of a fleet.

To the adopting this or a ſimilar mode in land ſervice the following are objections: That in the latter caſe the variety of matter neceſſary to be conveyed, is ſo infinitely greater, that the combinations would become too complicated.

Alſo, ſuppoſe the perſon for whom the information is intended, be in the direction of the wind: in this caſe, the flag will preſent a ſtraight line only, and at a little diſtance ſcarce viſible. At ſea, this inconvenience is remedied by the repeating frigates, whoſe name denote their office; as if A. B. fig. 1. be two ſhips in the line, and A. the admiral's ſhip, wants to give an order to B. The [redacted] repeating frigate C. is ſo ſtationed, in the rear, and out of the line, that ſhe ſees the ſignal given by A. while her repetition of that ſignal is ſeen by all the veſſels in the direction of B.

The Romans were ſo well aware of this inconvenience of flags, that many of their ſtandards were ſolid, and the name manipulus denotes the rudeſt of their modes, which was a truſs of hay fixed on a pole.

Thoſe who are not impoſed on by the adoption of a greek derivative, will immediately ſee, that Lord Howe's invention of numerical ſignals is a telegraph perfectly adequate to naval purpoſes, but perhaps not eaſily transferred to land ſervice, for the reaſons before obſerved. At the Maker tower, Plymouth, the directionof the wind deſtroying the appearance of a flag, is remedied by balls of varied magnitude and colour, which may be ſeen by ſhips on every point; but ſtill the latter objection remains, that the variety of matter which may occur at land can only be anſwered by literal communication.

The principle of water always keeping its own level has been ſuggeſted as a mode of conveying intelligence; as for example, ſuppoſe a pipe A. B. fig. 2. to reach from London to Dover, and to have a perpendicular tube connected to each extremity; as A. C. and B. D. then, if the pipe be conſtantly filled with water to a certain height, as A. E. it will alſo riſe to its level in the oppoſite perpendicular tube B. F. and if one inch of water be added in the tube A. C. it will inſtantly produce a ſimilar elevation in the tube B. D. ſo that by correſponding letters being adapted to the tubes A. C. and B. D. at different heights, intelligence might be conveyed.

This experiment may anſwer, and, I believe, has been employed, as a trick by jugglers, to convey information from one room to another by confederacy; but on the firſt view is liable to ſo many objections, that it could never be adopted to facilitate the object of very diſtant communication.

Full as many if not greater objections will, I believe, operate againſt every mode of electricity being uſed as the vehicle of information.

The required magnitude of painted or illuminated letters offers an inſurmountable obſtacle; beſides in them, one object would be loſt, that of the language being figurative.

A ſhort deſcription of the machine the French have uſed will ſhew its inconveniences, and the errors it is ſubject to. In its ſimpleſt form it is compoſed of a poſt fixed upright in the ground, as A. B. fig. 3. having a tranſverſe beam C. D. moveable on a circular joint at B. ſo as to give it any required inclination in regard to the perpendicular poſt A. B.; C. F. and D. E. are two leſſer arms, moveable alſo on circular joints at C. and D. ſo as to make any angle with the greater beam C. D. It is evident with this machine, that to every angular change of the greater beam or of the leſſer end arms, a different letter or figure may be annexed. But where the whole difference conſiſts in the variation of the angle of the greater or leſſer pieces much error may be expected, from the inaccuracy either of the operator or the obſerver: beſides, to be of diſtant utility, the object muſt be large, and when the upright poſt A. B. is very lofty, and the dimenſions of the tranſverſe beam great, mechanical work will be required to give it motion, and the operation will become proportionably long and tedious. In the Pariſian telegraph it is ſaid the different poſitions are given to the machine by means of ropes paſſing over large pullies: but wherever cords are uſed, they are liable to the change of weather and to numberleſs inconveniences, which, in the preſent inſtance, could not be ſurmounted even by the uſe of chains.

Another idea is perfectly numerical, which is to raiſe and depreſs a flag or curtain a certain number of times for each letter, according to a previouſly concerted ſyſtem: as, ſuppoſe one elevation to mean A. two to mean B. and ſo on through the alphabet; but in this caſe the leaſt inaccuracy in giving or noting the number, changes the letter; and alſo, if A. be marked by one elevation, and we go on in progreſſion, the laſt letters of the alphabet will become a tedious operation.

I ſhall mention one other method offered, which is an ingenious combination of the magnetical experiment of Comus, and the teleſcopic micrometer. Suppoſe A. B. fig. 2. to be a long beam of wood, as the maſt of a barge, moving on a center at A. having an index as C. which on the beam being put in motion will ſucceſſively point to the diviſions of a ſemi-circle D. E. F. to which letters are annexed. Then, having a correſponding ſemi-circle of mother of pearl incloſed in a teleſcope with a hair or ſmall wire, ſo made moveable that it may at all times be brought parallel to the beam A. B. ſeen through the teleſcope, it is evident the ſame letter may be marked by this hair or wire as is intended by the beam A. B.

When this machine is adapted to any conſiderable diſtance, the moveable beam A. B. muſt be of a proportionable length and magnitude; ſuppoſe only twenty-feet long by two in breadth; this will be a machine rather difficult to manage without the aid of mechanic powers, after which the accuracy of the obſervation will depend on the goodneſs of the teleſcope, the perfect level on which it is placed, and the obſerver being accuſtomed to the management of optical inſtruments; beſides, the flickering vapor, particularly frequent on the ſea coaſt, will, I apprehend, if not change the apparent direction of the beam, at leaſt ſo far render it difficult to aſcertain, as to cauſe great confuſion in the diviſions, which in the teleſcope muſt neceſſarily be ſmall.

By two lamps fixed on the beam A. B. its direction during the night is to be obſerved, and the hair being brought parallel with them, marks the ſemi-circle in the teleſcope as by day. If the center A. be much elevated, and inſtead of the index A. C. another arm be made equal to A. B. and one of them be diſtinguiſhed by a croſs, the alphabet may then be arranged in a whole circle, and the diviſions made larger; ſtill many difficulties remain not eaſily obviated in extenſive practice.

Theſe objections to the modes hitherto offered have given riſe to the following idea, which I believe new, but how far it may anſwer the end propoſed, practical experiment on the great ſcale muſt determine. On the workmanſhip required I ſhall make this previous obſervation, that an ordinary carpenter and blackſmith are adequate to the erection or repair of any part of the machine, and that the teleſcope which may be uſed, need only have ſuch powers as will give clearneſs to the object, without too much magnifying the intervening vapors; or what is commonly termed a night-glaſs.

The principle of this telegraph is ſimply that of a Venetian blind, or rather what are called the lever boards of a brewhouſe, which, when horizontal, preſent ſo ſmall a ſurface to the diſtant obſerver, as to be loſt to his view, but are capable of being in an inſtant converted into a ſcreen of a magnitude adapted to the required diſtance of viſion.

Let A. B. and C. D. fig. 5. two upright poſts fixed in the ground, and joined by the braces B. D. and E. F. be conſidered as the framework for nine lever boards working upon centers in E. B. and D. F. and opening in three diviſions by iron rods connected with each three of the lever boards. Let a. b. c. d. and e. f. g. h. be two leſſer frames fixed to the great one, have alſo three lever boards in each, moving by iron rods in the ſame manner as the others. If all theſe rods be brought ſo near the ground as to be in the management of the operator, he will then have five, I may call them, keys to play upon. Now as each of the handles i. k. l. m. n. commands three lever boards, by raiſing any one of them, and fixing it in its place by a catch or hook, it will give a different appearance to the machine, and by the proper variation of theſe five movements, there will be more than twenty-five, what may be called mutations, in each of which the machine exhibits a different appearance, and to which any letter or figure may, ad libitum, be annexed.

As the apparent magnitude of objects ſubtending ſmall angles varies inverſely as their diſtance, therefore the ſize of the machine muſt be regulated according to the required ſtations; the diſtance of which may be extended or diminiſhed according to the nature of the ground over which the intelligence is to be conveyed: for inſtance, if in the line of information there be found two riſing points of ground, whoſe diſtance may be from ſix to ten miles, ſuch would moſt probably be choſen as the ſituation of the telegraphs, and their magnitude might be proportionably varied.

Should it be required to give intelligence in more than one direction, the whole machine may be eaſily made to turn to different points on a ſtrong center, after the manner of a ſingle-poſt windmill.

To uſe this machine by night, a frame muſt be connected with the back part of the telegraph, as fig. 6. furniſhed with two upright grooves, in one of which a large light of combuſtible matter may be firſt elevated to the full height of the telegraph, as the ſignal of alarm, and that ſome conſequent information is to be given; then, while all the boards of the telegraph are cloſed, five lamps (which ſhould be varied in colour) may by the other groove be ſo drawn up and placed, as to be exactly behind each of the five openings of the machine, when the lamps at night will anſwer as the opening by day, and the operation will be preciſely the ſame.

On the OPERATION.

When all the boards are horizontal, as their thickneſs need not exceed one inch, the machine will be ſcarce viſible at a diſtance.

Suppoſe any number of theſe machines to be erected between Portſmouth and London. The bottom part of which may be eaſily formed into a cottage for the reſidence of the telegraphers, and all the handles to the rods may be brought into it, and numbered 1. 2. 3. 4. 5. Then on the ſignal being given from the telegraph, ſay No. 1. at Portſmouth, that ſome communication is to be made (which is done in the day by cloſing all the boards ſo as to give it the greateſt magnitude, and at night by elevating ſome inflamed ſubſtance) this ſignal, as ſoon as perceived, is repeated by No. 2. No. 3. and all the intermediate ones to London. For greater ſecurity, perhaps, ſome ſignal ſhould be repaſſed from London to Portſmouth, as by firſt cloſing all the boards, then opening the center diviſion, to ſhew all is in readineſs. The intelligence to be conveyed (written in a manner I ſhall deſcribe) is then given to the telegrapher at the Portſmouth machine, No. 1. and he forms the firſt figure, and is followed by all the others to London; ſo ſoon as he perceives this figure formed by No. 2. he then forms his ſecond figure, and ſo on to the end of the word; when he cloſes all the boards, to ſhew he has finiſhed one.

In theſe communications all double letters and all *e*'s final may be omitted; and although many contrivances may give the figures, yet it is leſs liable to miſtake to ſpell all numerical intelligence.

The paper uſed to note the intelligence is, I believe, a new idea of figurative correſpondence, and is as follows:

Suppoſe I have a ſpecies of muſic paper, only with ſix parallel lines inſtead of five, then the ſpaces, 1, 2, 3, 4, 5, between the lines, fig. 7. may anſwer to the openings of the machine 1. 2. 3. 4. 5. and I may annex any mutation of theſe numbers to any particular letter, and leave every perſon in total ignorance who is not poſſeſſed of the key. As for example, I ſend the line, fig. 7. to be communicated as intelligence by the telegraphs from London to Portſmouth; the telegrapher having received this, reads 1. 3. 5. which are the ſpaces marked, and from which the man who works the machine knows he is to open thoſe three diviſions, and leave the reſt cloſed; the telegrapher then ſays, 1. 2. 3. 4. on which he opens 2. and 4. and cloſes 5. next he reads 1. 3. 4. upon which the telegrapher cloſes the 2. and as the former letter was 1. 2. 3. 4. the machine will now give 1. 3. 4. He now ſees the ſign on the paper that a word is finiſhed; and therefore ſays, cloſe; by which the operator knows he is to ſhut all the diviſions till he receives the numbers for the next letter. The ſame proceſs is continued till the whole is written.

when an anſwer, as fig. 8. may be returned; the whole unintelligible to every perſon who is not poſſeſſed of the key, which it is obvious may be infinitely varied.

The telegrapher at each machine ſhould note down his work on ſimilar ruled paper, by which means not only the origin of any error may be immediately traced and inattention puniſhed: but by this means alſo ſhould the intelligence be communicated accurately as far as telegraph No. 3. but that by careleſsneſs No. 4. has not perceived the operation, the telegrapher, No. 3. has it in his power, ſo ſoon as No. 4. does perceive the operation, to re-commence the communication to No. 4. and the ſucceeding ones;—or even to ſend it forward by meſſenger.

In the model and in the plate I have made the three center diviſions equal, but perhaps it might give greater diſtinctneſs to the appearances if the middle diviſion, No. 3. was equal in ſize to No. 1. and No. 5. more eſpecially if that diviſion was placed as in the dotted figure. In real practice, however, as information is the object and not elegance of writing, I am convinced four movements are ſufficient; as, if the words be ſpelled according to their ſound, not to their orthography, in this caſe the number of letters in the alphabet may be reduced to fourteen or fifteen, and the mutations of the four diviſions perfectly adequate to convey them. By this means the diviſion No. 3. would be avoided, and the machine rendered more ſimple.

In objection to the operation at night it has been obſerved, that the lamps being in one ſtraight line, at a diſtance they will form one ſtreak of light. As the ſituation of the lamps is by no means a requiſite in practice, it may be better that they ſhould be in the poſitions o. o. o. o. fig. 5. which will alter no part of the machine either in principle or operation. And as it will be neceſſary in the real telegraph to have inclined timbers placed as ſupporters to its different parts, theſe may undoubtedly be ſo contrived (by ſtaves driven through them in a manner frequently practiſed in the pile engine) as to give a ready acceſs to every part of it, for the purpoſe of placing the lamps in any point, or on either ſide the frame according as the line of communication requires.

It is, however, impoſſible to foreſee every objection which may be offered, or every alteration that may with advantage be made in the machine itſelf. Practical mechanics may ſuggeſt improvement. Local circumſtances may require ſome change in its conſtruction. My endeavour has been briefly to deſcribe what the model ſhews diſtinctly, and to explain the principles on which it is formed, which, particularly in the figurative part, remain general, although on any occaſion at ſea it ſhould be found expedient even to uſe the port-holes of a ſhip, or, on land, the windows of a houſe, as the diviſions of the machine.

The various uſes to which any telegraph may be applied, muſt alſo reſt with future practical experiment. In a military view I cannot forbear obſerving, that, beſides its being uſed as a mode of ſpeedy correſpondence from one fixed ſtation to another, it may be of eſſential ſervice to have one made portable, and conveyed on a waggon, ſo as in a few minutes to be fixed up at the out-poſt of an army. By which an immediate communication may be kept up with the main body; and ſecret directions or information given, without that general alarm occaſioned by the firing of cannon, which has alſo the inconvenience of putting the enemy equally on the alert.

FINIS.

[illegible]